SUMMARY OF FIRE PROTECTION PROGRAMS FOR CALENDAR YEAR 2004

UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF NUCLEAR AND FACILITY SAFETY POLICY (EH-2.1)
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FOREWORD

This edition of the Annual Fire Protection Program Summary for the Department of Energy (DOE) continues the series started in 1972.

Since May 1950, an Annual Fire Protection Program Summary (Annual Summary) has been submitted by DOE's fire protection community under the requirements of DOE's predecessor agencies: the Atomic Energy Commission (AEC) and the Energy Research Development Administration (ERDA). This report is currently required by section 5a.(8) of DOE Order 231.1, "Environment, Safety and Health Reporting" and is considered the primary source for quantifying monetary loss from fire across the DOE Complex.

The report for calendar year (CY) 2004 was summarized from information sent to Headquarters by 38 out of 56 reporting elements, representing approximately 76 percent of DOE's ownership. For comparison purposes, field offices are arranged according to the DOE Field Office reporting format, with a total of 23 categories represented. Abbreviations are identified in the Glossary, as are the DOE site reporting elements and major definitions.

In 1999, the Annual Summary reporting process was automated to streamline data collection and provide a more comprehensive look at reporting element activities. It is now possible to view all responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels. Additionally, a built-in reference to other DOE reporting activities (ORPS) is provided, allowing reporting elements and DOE managers the opportunity to easily review all fire protection events and activities under their responsibility. For example, the information contained in this publication was extracted from the Annual Summary application taken at the Headquarters level for CY 2004. A copy of the latest version of this application can be obtained at the following internet address: http://www.eh.doe.gov/fire/summary/summary.html.

GLOSSARY

Field/Area/Site Organization abbreviations:

PSO	Amarillo Area Office
CH	Chicago Operations Office
HQ	DOE Headquarters
GFO	Golden Field Office
ID	Idaho Operations
KSO	Kansas City Site Office
LM	Legacy Management
NETL	National Energy Technology Laboratory
NPR	Naval Petroleum Reserves
NV	Nevada Site Office
NSC	NNSA Service Center
OR	Oak Ridge Operations Office
OFO	Ohio Field Office
PNR	Pittsburgh Naval Reactors Office
PA	Power Marketing Administrations[1]
RD	Repository Development
RL	Richland Operations Office
RF	Rocky Flats Operations
SSO	Sandia Site Office
SRO	Savannah River Operations
SPR	Strategic Petroleum Reserves[2]
YSO	Y-12 Site Office

Site abbreviations:

ALA	Ames Laboratory
ANLW	Argonne National Laboratory, West
ANLE	Argonne National Laboratory, East
AEMP	Ashtabula Environmental Management Project
BAPL	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
ETTP	East Tennessee Technology Park

1. Power Administration organizations are comprised of: the; the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

2 Strategic Petroleum Reserve Sites include: Bayou Chochtaw, Big Hill,Bryan Mound and West Hackberry.

EML	Environmental Measurements Laboratory
FNAL	Fermi National Accelerator Laboratory
FEMP	Fernald Environmental Management Project
GJO	Grand Junction
HAN	Hanford Site[3]
INEEL	Idaho National Engineering & Environmental Laboratory
ITRI	Inhalation Toxicology Research Institute
KAPL	Knolls Atomic Power Laboratory
KCP	Kansas City Plant
KSO	Kesserling Site
LBL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratories
LANL	Los Alamos National Laboratories
MEMP	Miamisburg Environmental Management Project
MGN	Morgantown Federal Energy Technology Center
NREL	National Renewable Energy Laboratory[4]
NRF	Naval Reactor Facilities
NTS	Nevada Test Site[5]
NBL	New Brunswick Laboratory
ORISE	Oak Ridge-Institute of Science & Education
ORNL	Oak Ridge National Laboratories
PAN	Pantex Site
PGDP	Paducah Gaseous Diffusion Plant[6]
PNL	Pacific Northwest Laboratory
PGH	Pittsburgh Federal Energy Technology Center
POR	Portsmouth Gaseous Diffusion Plant[6]
PPPL	Princeton Plasma Physics Laboratory
ROSS	Ross Aviation, Inc.
SLAC	Stanford Linear Accelerator Center
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SRS	Savannah River Site
TJNL	Thomas Jefferson National Accelerator Facility
WIPP	Waste Isolation Pilot Plant
WSS	Weldon Spring Site
WVDP	West Valley Demonstration Project
WS	Windsor Site

[3] Hanford Site includes the Pacific Northwest National Laboratory

[4] National Renewable Energy Laboratory includes the Wind Site

[5] Nevada Test Site Includes: Amador Valley Operations, Las Vegas Operations, Nevada-Los Alamos Operations, Nevada-Special Technology Laboratory, Washington Aerial Measurements Operation, and Nevada-EG&G Wolburn NV.

[6] On July 1, 1993, a lease agreement took effect between the DOE and the United States Enrichment Corporation (USEC) essentially transferring all ownership responsibilities to USEC.

Y-12	Y-12 Plant
YM	Yucca Mountain Project

The below reference is used throughout the report to identify various DOE elements:

DOE field organization (abr.)/Site(abr.)
Example: AL/LANL

DEFINITIONS

The following terms are defined in the text of DOE Manual M 231.1-1, "Environment, Safety, and Health Reporting Manual." Major definitions not included in this manual have been extracted from the rescinded order DOE 5484.1 to clarify key concepts. Section references to these documents are given at the end of the definition.

1. **Property Value:** The approximate replacement value of all DOE-owned buildings and equipment. Included are the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Excluded are the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (APPENDIX C, DOE M 231.1)

2. **Estimated Loss:** Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence conditions irrespective of whether this is in fact performed. The estimate includes: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage, (3) any reductions for salvage value, and (4) any lost revenue experienced as a result of the accident. The estimate excludes: (1) down time; and (2) any outside agency payments. Losses sustained on private property is not reportable, even if DOE is liable for damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and non-fire loss events. (APPENDIX C, DOE M 231.1)

3. **Fire Loss:** All damage or loss sustained as a consequence of (and following the outbreak of) fire shall be classified as a fire loss. Exceptions are as follows: (1) burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if self-sustained combustion exists after power is shut off. (APPENDIX C, DOE M 231.1)

5. **Loss Rate:** Unit of comparison in cents loss per $100 of property value.

EXECUTIVE SUMMARY

DOE experienced no fatalities or major injuries from fire in CY 2004. There were however, 86 fire events reported during the period causing an estimated $622,613 in property damage. These losses are approximately $452,600 less than fire losses sustained in CY 2003, with 93 percent of losses attributed to 5 incidents. Loss comparisons between the DOE and private industry are performed by normalizing data against total property value. DOE property valuation increased by about 2.7 percent (from 70.6 to 72.6 Billion dollars) resulting in an overall CY 2004 fire loss rate of approximately 0.09 cents for each $100 in property value.

Recurring costs for fire protection exceeded 135 million dollars in CY 2004. On a ratio of cost to total property value, the DOE spent approximately 18.6 cents per $100 in property value for recurring fire protection activities.

In CY 2004, four fires were controlled by automatic fire suppression systems. The success of these systems were, however, offset by the inadvertent actuation of 26 systems primarily due to employee or weather related causes (7 and 5 events respectively).

DOE PROPERTY LOSS EXPERIENCE

Property value estimates serve as a common denominator for comparing Annual Summary loss rates. In CY 2004 property values increased by approximately 2.7 percent to a new total of approximately 72.6 Billion dollars. DOE elements reported 86 fire incidents[1] that accounted for a total year-end fire loss of $622,613. These events are categorized as follows:

Fire/Smoke (Building) – 31 Events
Fire/Smoke (Brush) – 25 Events
Fire/Smoke (Vehicle) – 11 Events
Fire/Smoke (Other) – 19 Events

DOE's fire loss rate for CY 2004, as summarized from field organization reports, is approximately 0.09 cents loss per $100 property value.

Table 1 characterizes Annual Summary loss histories since 1950 and includes both fire and non-fire loss rate categories. Numbers shown in parentheses represent a 5-year running average, where applicable. The accompanying figures are described as follows:

Figure 1 - graphical representation of the Department's property valuation since 1950
Figure 2 - fire and non-fire property loss since 1982
Figure 3 - fire loss rates since 1988

[1] By comparison, the Occurrence Reporting and Processing System (ORPS) logged 44 fire events in CY 2004. Also, page 13 of this report indicates that Fire Departments cataloged a total of 606 Fire events over the year, with a majority of events (520) determined by the sites to be insignificant for Headquarters reporting purposes.

Figure 4 - the current year's fire event tally by Field Organizations
Figure 5 - the current year's fire loss (dollars) by Field Organizations
Figure 6 - the current year's fire loss rate by Field Organizations

Organizations not shown on Figures 4 through 6 reported either insignificant or zero losses for the year.

Trending of fire loss data indicates that a small number of incidents constitute the majority of dollar losses reported to the DOE. For example, 5 fire incidents this year accounted for approximately 93 percent of the total dollar loss amount.

The largest fire loss for the year noted as follows:

1. RFO/RF – Fire in foamed polyurethane insulation that self ignited in the tunnel area of Building 991 during the final stages of demolition. The value of the loss ($450,000) was not based on damage to the facility, but rather the costs associated with fighting the fire, fire watches and the resulting investigation which included independent experts.

Table 1
DOE Loss History From 1950 To Present

Year	Property Value (Millions of Dollars)	Fire Loss (Dollars)	Non-fire Loss (Dollars)	Loss Rates (cents per 100 Dollar Value) Fire*	Non-Fire*	Total*
50	1,800.00	486,389	10,050	2.70 -	0.06 -	2.76 -
51	2,177.10	38,318	317,797	0.18 -	1.46 -	1.64 -
52	3,055.10	449,107	356,600	1.47 -	1.17 -	2.64 -
53	4,081.00	148,142	427,430	0.36 -	1.05 -	1.41 -
54	6,095.90	185,438	190,436	0.30 -	0.31 -	0.62 -
55	6,954.20	125,685	330,103	0.18 (1.00)	0.47 (0.81)	0.66 (1.81)
56	7,364.10	2,206,478	940,945	3.00 (0.50)	1.28 (0.89)	4.27 (1.39)
57	7,973.20	590,663	885,936	0.74 (1.06)	1.11 (0.86)	1.85 (1.92)
58	8,102.50	275,560	476,265	0.34 (0.92)	0.59 (0.84)	0.93 (1.76)
59	10,301.80	199,841	998,060	0.19 (0.91)	0.97 (0.75)	1.16 (1.67)
60	10,708.60	636,228	764,823	0.59 (0.89)	0.71 (0.88)	1.31 (1.77)
61	11,929.90	325,489	5,530,566	0.27 (0.97)	4.64 (0.93)	4.91 (1.91)
62	12,108.80	3,020,023	293,341	2.49 (0.43)	0.24 (1.60)	2.74 (2.03)
63	13,288.90	599,056	776,998	0.45 (0.78)	0.58 (1.43)	1.04 (2.21)
64	14,582.80	480,519	870,516	0.33 (0.80)	0.60 (1.43)	0.93 (2.23)
65	15,679.30	1,743,448	2,106,621	1.11 (0.83)	1.34 (1.35)	2.46 (2.18)
66	16,669.00	158,220	698,753	0.09 (0.93)	0.42 (1.48)	0.51 (2.41)
67	17,450.90	359,584	2,423,350	0.21 (0.90)	1.39 (0.64)	1.59 (1.53)
68	18,611.90	155,986	713,097	0.08 (0.44)	0.38 (0.87)	0.47 (1.31)
69	20,068.30	27,144,809	909,525	13.53 (0.37)	0.45 (0.83)	13.98 (1.19)
70	22,004.30	89,456	1,611,336	0.04 (3.00)	0.73 (0.80)	0.77 (3.80)
71	24,155.80	78,483	1,857,566	0.03 (2.79)	0.77 (0.68)	0.80 (3.47)
72	26,383.50	222,590	698,061	0.08 (2.78)	0.26 (0.75)	0.35 (3.52)
73	27,166.70	117,447	2,258,241	0.04 (2.75)	0.83 (0.52)	0.87 (3.27)
74	28,255.50	249,111	930,766	0.09 (2.75)	0.33 (0.61)	0.42 (3.36)
75	31,658.30	766,868	4,485,481	0.24 (0.06)	1.42 (0.59)	1.66 (0.64)
76	35,512.70	251,849	2,040,727	0.07 (0.10)	0.57 (0.72)	0.65 (0.82)

Fire Protection Summary
For Calendar Year 2004

Year	Property Value (Millions of Dollars)	Fire Loss (Dollars)	Non-fire Loss (Dollars)	Loss Rates (cents per 100 Dollar Value) Fire*	Non-Fire*	Total*
77	39,856.10	1,084,823	2,529,161	0.27 (0.11)	0.63 (0.68)	0.91 (0.79)
78	47,027.10	12,976,036	4,501,943	2.76 (0.14)	0.96 (0.76)	3.72 (0.90)
79	50,340.80	654,716	1,886,307	0.13 (0.69)	0.37 (0.78)	0.50 (1.47)
80	54,654.70	1,385,686	7,160,249	0.25 (0.69)	1.31 (0.79)	1.56 (1.49)
81	59,988.80	2,042,633	2,600,855	0.34 (0.70)	0.43 (0.77)	0.77 (1.47)
82	65,360.40	948,691	3,252,277	0.15 (0.75)	0.50 (0.74)	0.64 (1.49)
83	70,484.40	731,234	9,765,828	0.10 (0.73)	1.39 (0.71)	1.49 (1.44)
84	82,166.90	1,549,807	4,917,513	0.19 (0.19)	0.60 (0.80)	0.79 (0.99)
85	86,321.84	1,145,975	2,983,322	0.13 (0.21)	0.35 (0.85)	0.48 (1.05)
86	82,787.52	805,030	4,490,262	0.10 (0.18)	0.54 (0.65)	0.64 (0.83)
87	91,927.20	1,570,736	1,440,093	0.17 (0.13)	0.16 (0.67)	0.33 (0.81)
88	92,998.00	466,120	7,837,000	0.05 (0.14)	0.84 (0.61)	0.89 (0.74)
89	107,948.00	615,551	6,890,000	0.06 (0.13)	0.64 (0.50)	0.70 (0.63)
90	115,076.00	8,392,746	9,078,000	0.73 (0.10)	0.79 (0.51)	1.52 (0.61)
91	118,868.68	608,740	1,820,065	0.05 (0.22)	0.15 (0.59)	0.20 (0.81)
92	118,267.06	1,166,858	2,486,696	0.10 (0.21)	0.21 (0.52)	0.31 (0.73)
93	119,826.25	679,939	2,338,595	0.06 (0.20)	0.19 (0.53)	0.25 (0.73)
94	124,350.29	1,533,717	1,869,933	0.12 (0.20)	0.15 (0.40)	0.27 (0.60)
95	120,321.68	720,720	911,746	0.06 (0.21)	0.08 (0.30)	0.14 (0.51)
96	113,471.00	2,372,482	3,653,350	0.21 (0.08)	0.32 (0.16)	0.53 (0.24)
97	102,947.24	544,924	5,567,963	0.05 (0.11)	0.54 (0.19)	0.59 (0.30)
98	99,127.79	316,475	1,062,313	0.03 (0.10)	0.11 (0.26)	0.14 (0.36)
99	110,858.47	443,049	2,467,991	0.04 (0.10)	0.22 (0.24)	0.26 (0.34)
00	102,514.01	102,861,283	312,839	10.03 (0.08)	0.03 (0.25)	10.06 (0.33)
01	103,215.56	287,263	218323	0.03 (2.07)	0.02 (0.25)	0.05 (2.32)
02	98,779.44	1,541,174.00	920,673	0.16 (2.04)	0.09 (0.19)	0.25 (2.23)
03	70,812.80	1,075,309.00	No longer collected	0.15 (2.06)	NC NC	NC NC
04	72,601.95	622,613	No longer collected	0.09 (2.08)	NC NC	NC NC

*Numbers shown in parentheses represent the 5-year running average.

Figure 1

DOE Property Valuation

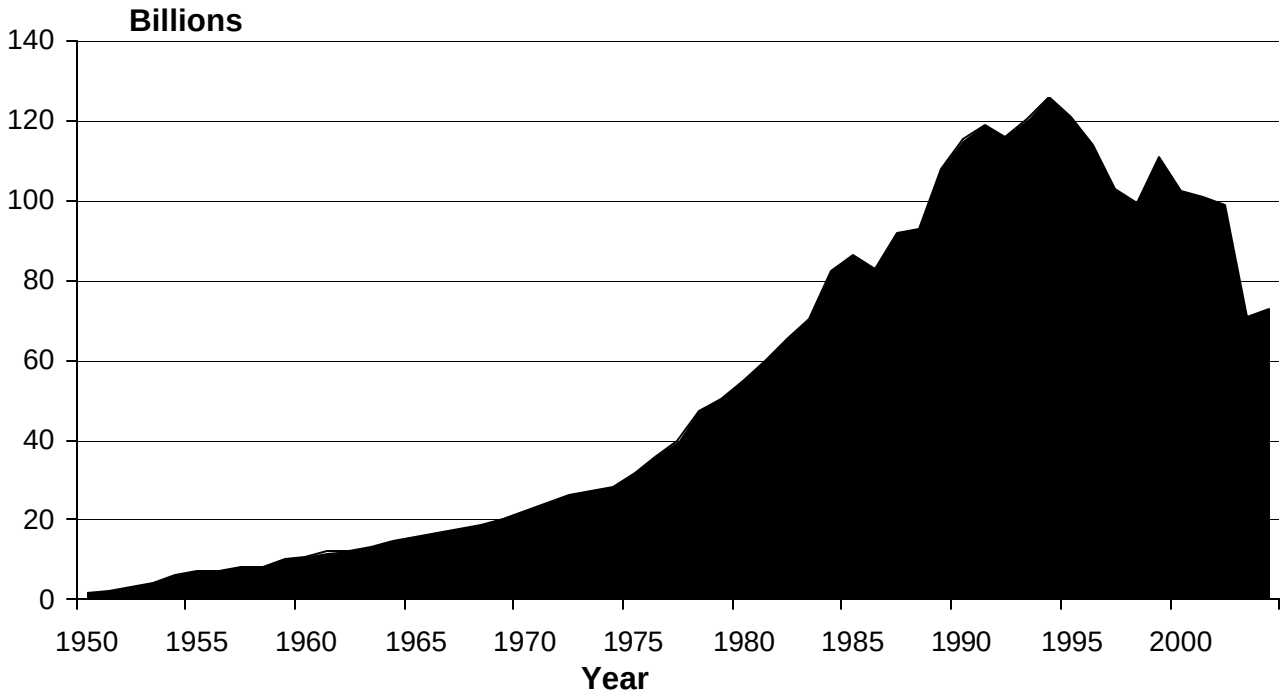


Figure 2

Property Loss

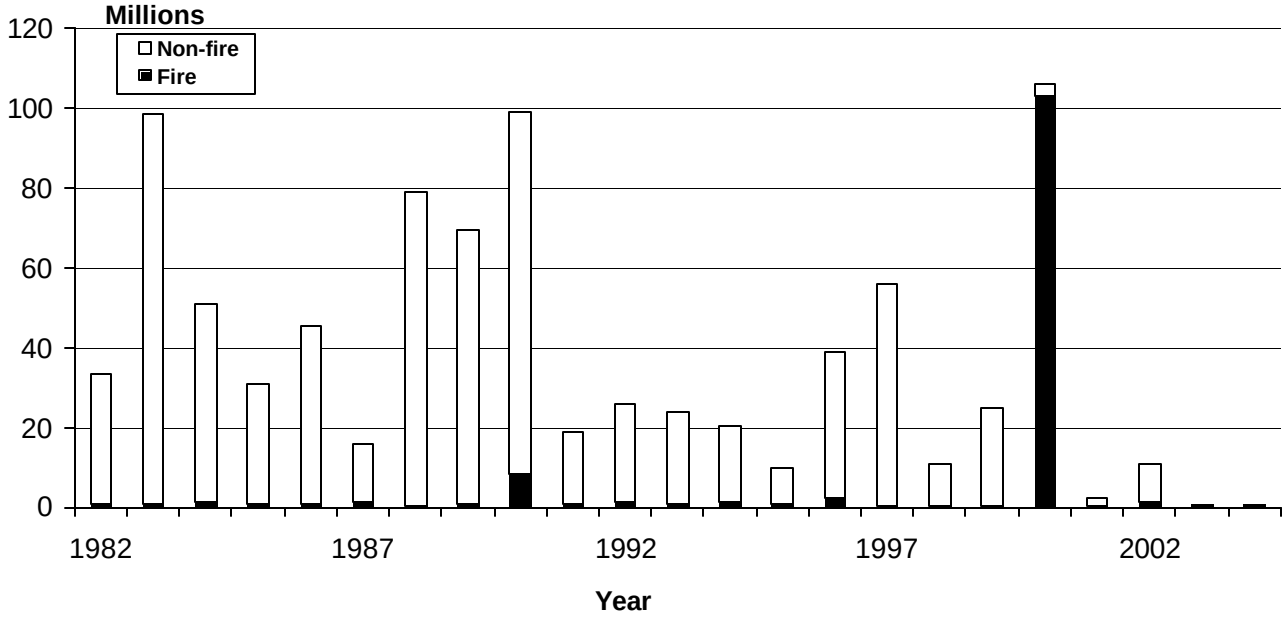


Figure 3

DOE Fire Loss Rate

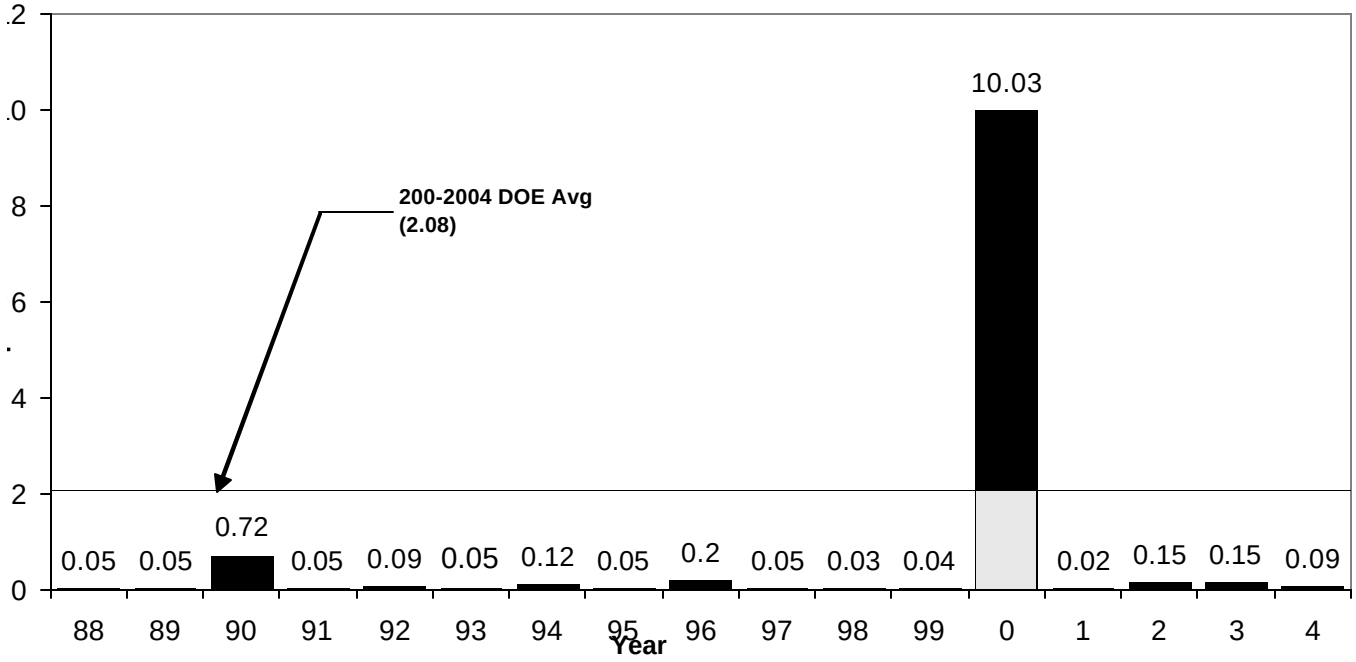


Figure 4

Fire Events by Field Organization

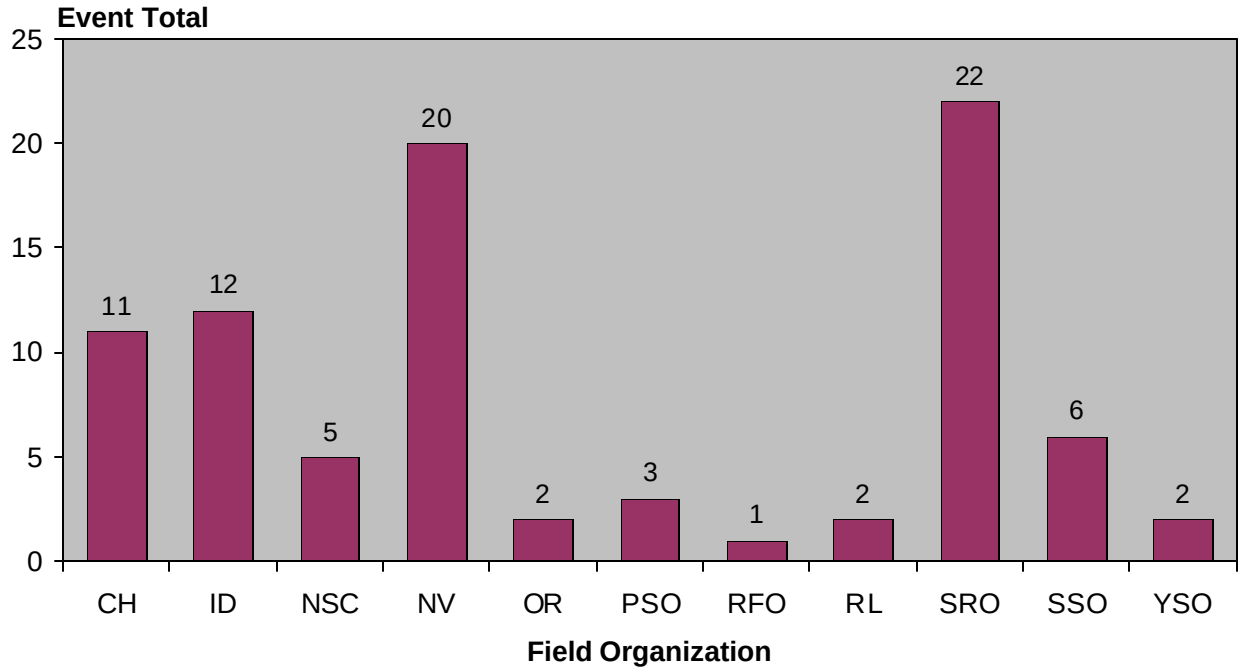


Figure 5

Fire Loss Amount by Field Organization

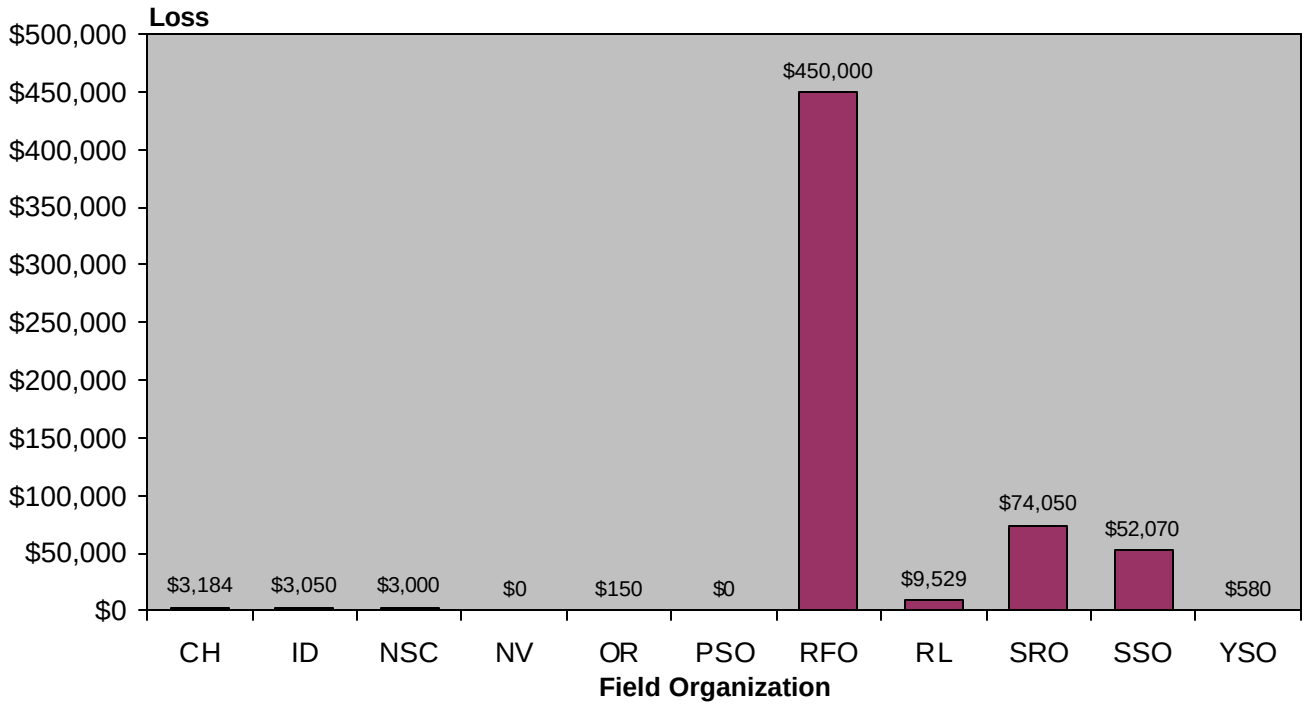
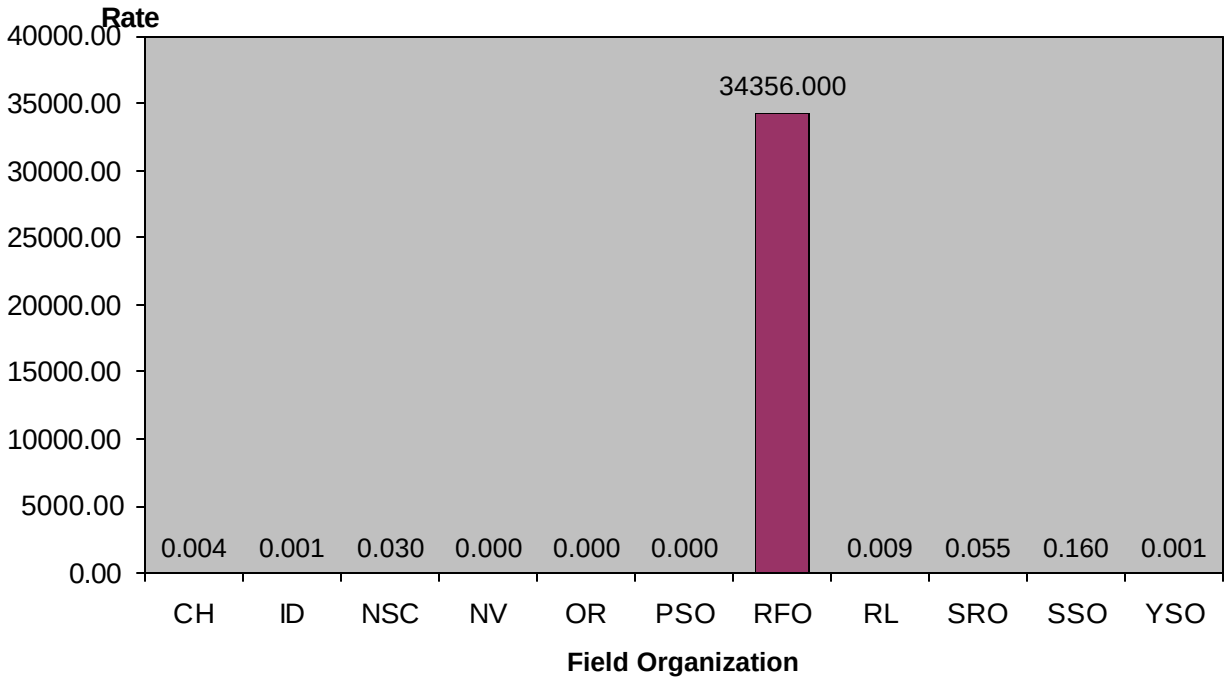


Figure 6

Fire Loss Rate by Field Organization



SUMMARY OF FIRE DAMAGE INCIDENTS

The following table provides a description major DOE fire losses over the year. See Tables 3 and 6 for fire events involving fixed automatic fire suppression systems:

Table 2: **Summary of Fire Damage Incidents**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire/Smoke (Building)	RFO/RF	One significant fire loss involving a fire in foamed polyurethane insulation that self ignited in the tunnel area of Building 991 during the final stages of demolition. The value of the loss was not based on damage to the facility, but rather the costs associated with fighting the fire, fire watches and the resulting investigation which included independent experts.	$450,000.00
Fire/Smoke (Building)	SRO/SRS	At 03:56, SRSFD personnel were dispatched to a call-in notification of a fire with smoke showing in 719-2A trailer. WSI was patrolling the area and saw smoke and flames. Upon arrival, approximately 15% of one end of the double wide office trailer was involved in fire breaching through the roof at two different locations. Two hand lines were pulled – one for interior use and the other for exterior use. The fire was extinguished using approximately 1000 gallons of water and the search for extension found no further activity. The cause appears to be electrical. 15% of facility was heavily damaged by fire and the remaining 85% sustained minor water and moderate smoke damage. There were no injuries and the dollar loss estimate is $48,000.	$48,000.00
Fire/Smoke (Building)	SSO/SNL-AL	SNL-AL Event No.:878004 The IC, Rescue Recon, SNL Paramedics, KAFB FD and SNL Security responded a report of smoke coming from the roof of the building. KAFB FD extinguished the fire on a roof air handler. The building was declared fire safe and the probable cause of the fire was electrical. Cause: The exact cause was not determined. The likely cause was either (1) migration of heat or flame from the gas-fired direct heated air chamber section back into the celldeck evaporative cooling section, or (2) operation of the slinger pump in the celldeck evaporative cooling section that caused the motor to overheat and cause the celldeck to ignite.	$48,000.00
Fire/Smoke (Building)	SRO/SRS	At 12:14, dispatch received a call-in notification of a fire at 704-5G, Restroom Trailer, with heavy smoke showing. Facility personnel unsuccessfully tried to extinguish the fire using four 10-lb. dry chemical fire extinguishers. SRSFD personnel responded and used approximately 200 gallons of water to extinguish the fire after power was de-energized. The majority of the fire damage was to a shower stall and the structural members underneath. The Incident Commander requested a WSI Investigator because of the suspicious nature of the fire. At 14:05, SLED was also requested to respond for investigation. There were no injuries and the dollar loss is $25,000.00	$25,000.00
Fire/Smoke (Brush)	NSC/LLNL	A grass fire was started by a subcontractor who was mowing grass. The mower struck a rock or some other foreign object, which ignited the grass. The LLNL Fire Department responded and then called in mutual aid resources because of the proximity of the fire to buildings and wind conditions. Because of the mutual aid request, this incident was declared an	$6,000.00

Table 2: **Summary of Fire Damage Incidents**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
		Operational Emergency at approximately 2:45 PM. The Operational Emergency was terminated at 3:05 PM when the fire was brought under control.	
Fire/Smoke (Building)	NSC/LLNL	Following a shot in the large two-stage gas gun, two gun technicians observed a small blue flame coming from the joint between the acceleration reservoir (AR) and the pump tube of the gas gun. The gun room was immediately evacuated as a precautionary measure and the fire department was notified. Upon arrival, the fire department took the added precaution of evacuating the entire building. After the fire was extinguished, (about 20 minutes; it had been decided to let the fire itself burn out), a thorough investigation of the cause was begun	$6,000.00
Fire/Smoke (Building)	NSC/LLNL	Small fire in the capacitor test stand in B391. It was determined than an inductor broke and had arced and started Lexan on fire. Automatic fire detectors in the facility detected the small fire and transmitted the alarm to the central fire alarm center. The fire alarm control panel automatically switched the test stand off as designed.	$6,000.00
Fire/Smoke (Brush)	NSC/LLNL	Grass fire started at Site 300 near the main entrance. The LLNL Fire Chief called for assistance from the City of Tracy, Alameda County and California Division of Forestry, Tracy. An Operational Emergency was declared at 5:15 PM. The fire was put out at 6:07 PM and the emergency was terminated. There was some damage to the central water treatment facility.	$6,000.00
Fire/Smoke (Building)	NSC/LLNL	A piece of magnesium alloy metal that was being heat treated caught fire. The piece of metal was one of three that was being heated in an air furnace, in Building 231, most likely because the metal exceeded its auto-ignition temperature. When the metal caught fire, the technician contacted the LLNL Fire Department, who promptly responded and moved the oven outside the building and extinguished the fire. The damage was limited to the oven and there were no personnel injuries or damage to the facility.	$6,000.00

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 17 incidents were reported where water-based suppression systems operated in CY 2004: 10 were wet-pipe systems, 3 dry-pipe and 2 deluge, 1 water spray and 1 foam system. Two water-based activations (1 Wet pipe and 1 dry pipe) were directly related to fire during the year. System activations were caused by the following events: employee related (5), design/material related (3), weather related (4), other (1), and unspecified/other related (4).

Water-based system activations of interest are listed in Table 3.

Table 3: **Water Based System Actuations**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
Leaks, Spills, Releases	SSO/SNL-AL	SNL-AL Event No.: 954004 The IC, SNL Security and Maintenance responded to a report of a water flowing out into a nearby storm drain. The cause of water leak was due to a frozen	$103,000.00

Table 3: **Water Based System Actuations**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
		sprinkler water line that broke. The valve was shut off and water leak was stopped. Appropriate personnel were notified and Facilities logged the water line for repairs. Cause: The cause of the flood was a broken 90 degree elbow on the automatic sprinkler piping due to frozen and expanded water. The cause of major flood damage was the lack of adequate and timely response by both Security (HCC) and the KAFB Fire Department (FS). Loss Estimates: $103,000 (Business Interruption - $95,000; Property Loss - $8,100	
Leaks, Spills, Releases	SSO/SNL-AL	SNL-AL Event No: 63004 Emergency responders were contacted and arrived on scene to find contractor personnel had activated a single sprinkler head on the second floor while soldering next to it. KAFB FD declared the building fire safe and personnel were able to commence cleanup of the water. Operating personnel were allowed to re-enter the building once all areas were verified to be safe. Cause: Accidental activation of fire protection sprinkler head due to soldering flame impingement. Loss Estimates: $20,800 (Business Interuption - $13,800; Property Loss - $7,000)	$20,800.00
Leaks, Spills, Releases	ID/INEEL	A frozen fire water line (due to loss of heat in the building) caused a discharge of approximately 100 gallons of water. A globe valve, several fittings, and a few sprinkler heads required replacement. The fire water system was isolated as compensatory measure, but was not sufficiently drained.	$14,456.00

There are a total of 245 incidents in DOE records where water based extinguishing systems operated in a fire. The satisfactory rate of performance is 99.2 percent, or 243 times out of 245 incidents. The two failures during a fire were attributed to; a closed cold weather valve in 1958 controlling a single sprinkler in a wood dust collector and, a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

From the above history, DOE has experienced 116 fires that were either controlled or extinguished by the wet-pipe type of automatic suppression system. Table 4 below provides a summary on the number of sprinklers actuated to control or extinguish a fire against the number of occurrences where this event was reported. For example: 95 percent of these fires were controlled or extinguished with 4 or less sprinklers activating, 91 percent were controlled with 3 or less sprinklers activating, and so on.

The significance of this table is to highlight actual performance on systems that have been installed according to standard design practices (in this case the National Fire Protection Association (NFPA) Standard 13, Installation of Sprinkler Systems). By comparing the actual performance to design requirements, the designer or reviewer can get a sense of the conservativeness of the design area requirement in the National consensus standard. This

table could also be used to apply this performance metric to other design aspects, such as sprinkler system water containment, since no specific design criteria exist on the subject.

Table 4
DOE Wet-Pipe Automatic Suppression Performance
1955 to 2003

Number of Sprinklers Activated per Fire Event	Number of Events	Cumulative Total of Events	Percentage of Event	Cumulative Percentage of Events
1	81	81	70	70
2	19	100	16	86
3	6	106	5	91
4	4	110	3	95
5	2	112	2	97
6	1	113	1	97
7	2	115	2	99
8	0	115	0	99
9+	1	116	1	100

NON WATER-BASED FIRE SUPPRESSION SYSTEM PERFORMANCE

Concerns regarding the effect of chlorinated fluorocarbons (CFCs) and Halon on the ozone layer have led to their regulation under the 1991 Clean Air Act. The Environmental Protection Agency has subsequently published rules on this regulation to include; prohibiting new Halon production, establishing container labeling requirements, imposing Federal procurement restrictions, imposing significant Halon taxes, issuing requirements for the approval of alternative agents, and listing essential areas where Halon protection is considered acceptable.

DOE's current policy does not allow the installation of any new Halon systems. Field organizations have been requested to aggressively pursue alternative fire suppression agents to replace existing systems and to effectively manage expanding Halon inventories. The long-term goal is the gradual replacement of all Halon systems.

In CY 2004, the DOE had 349 Halon 1301 systems in operation containing approximately 105,315 pounds of agent. Stored Halon 1301 inventory was reported at approximately 79,847 pounds[2]. Operational and stored inventory amounts for the Halon 1211 were reported at 85,097 and 11,336 pounds, respectively. Field organizations reported that 47 non-essential systems were removed from service in 2004, adding approximately 23,000 pounds to DOE's inventory.

[2] Amount excludes banked inventory at the SRS – 51,721 pounds Halon 1301, 0 pounds Halon 1211. SRO reports that the Halon bank is no longer accepting Halon inventory from the sites.

Table 5 provides a breakdown of the five largest Halon utilizing field organizations, listing both Halon 1301 (fixed system extinguishing agent) and Halon 1211 (portable extinguishing agent). Agent Drawdown amount represents the Halon released to the environment over the calendar year. The bulk of Halon utilized within the Power Administrations[3] is located at WAPA.

Table 5
Primary DOE Sites Utilizing Halon Suppression Systems

LOCATION	HALON 1301		AGENT DRAWDOWN	HALON 1211	
	ACTIVE (lbs.)	INVENTORY (lbs.)		ACTIVE (lbs.)	INVENTORY (lbs.)
SRO	23,553	0	848	0	0
NSC	19,743	16,316	0	41,128	1,500
CH	31,678	19,402	0	17,565	1,523
PA	10,828	2,331	0	2,155	0
SPR	6288	0	0	0	0
Total	92,090	38,049	848	60,848	3,023

Sites considering any Halon transfers outside the DOE are reminded that all excessed Halon should be transferred to the Department of Defense. Please contact you local Defense Logistics Agency for specific information relating to such transfers.

A total of 13 incidents were reported at DOE where Halon 1301 or other non-water based suppression systems operated in CY 2003. No sites reported any system failures during a fire. Additionally, approximately 1166[4] pounds of Halon 1301 were released to the environment. Non Water-based system activations of interest are listed in Table 6 below.

Table 6: **Non Water Based System Actuations**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Leaks, Spills, Releases	NV/NTS	Overheat condition in diagnostics trailer (air conditioner failure) caused the Halon system to actuate.	$0.00
Leaks, Spills, Releases	NV/NTS	Halon Release due to a lightning strike	$0.00
Leaks, Spills, Releases	NSC/LLNL	The automatic Carbon Dioxide system in the KDP cleaner enclosure discharged. The facility was experiencing HVAC problems, and the room had become quite warm as a result. It is believed that this contributed to system discharge. System is a single cylinder system actuated via thermal detection.	$0.00
Leaks, Spills, Releases	SRO/SRS	221-S EEC crane discharged 34# from the main cylinder. The Halon switch was accidently pushed.	$0.00

[3] In CY 1996, BPA ceased reporting any losses according to DOE O 231.1. Last known Halon amounts for the BPA were 14,495 lbs. in 6 systems and are not reflected in the current DOE totals.

[4] The above figure does not consider system leakage in a stable condition.

Table 6: **Non Water Based System Actuations**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
Leaks, Spills, Releases	SRO/SRS	25# Halon 1301 discharge appears to be related to excessive moisture in the crane cab.	$0.00
Leaks, Spills, Releases	SRO/SRS	25# Halon 1301 discharged after facility reset initial alarm form 5/28/04 and swapped over to reserve.	$0.00
Fire/Smoke (Building)	SRO/SRS	At 00:42, SRSFD personnel were dispatched to an activated fire alarm from the 221-H, New Warm Crane. The AC disconnect inside the crane cab evidently had some burning of electrical components within the disconnect enclosure. The Halon system activated and no fire was found after a delayed entry due to required RCO surveying prior to entry. Approximately 25 lbs. of Halon were discharged. The panel was left in alarm for E&I to troubleshoot electrical problem. There were no injuries and no costs incurred.	$0.00
Fire/Smoke (Building)	SRO/SRS	At 10:54, SRSFD personnel were dispatched to an activated fire alarm in 221-F, Warm Crane. Upon arrival, it was determined that 30 lbs. of Halon had dumped. Three facility personnel entered the crane and noticed the smell of smoke. They were unable to determine the origin of the smell. There were no injuries and no costs incurred.	$0.00
Leaks, Spills, Releases	SRO/SRS	28# Halon 1301 discharged, cause unknown.	$0.00
Leaks, Spills, Releases	SRO/SRS	25# Halon 1301 discharged, cause unknown.	$0.00
Leaks, Spills, Releases	SRO/SRS	28# Halon 1301 discharged, cause unknown.	$0.00

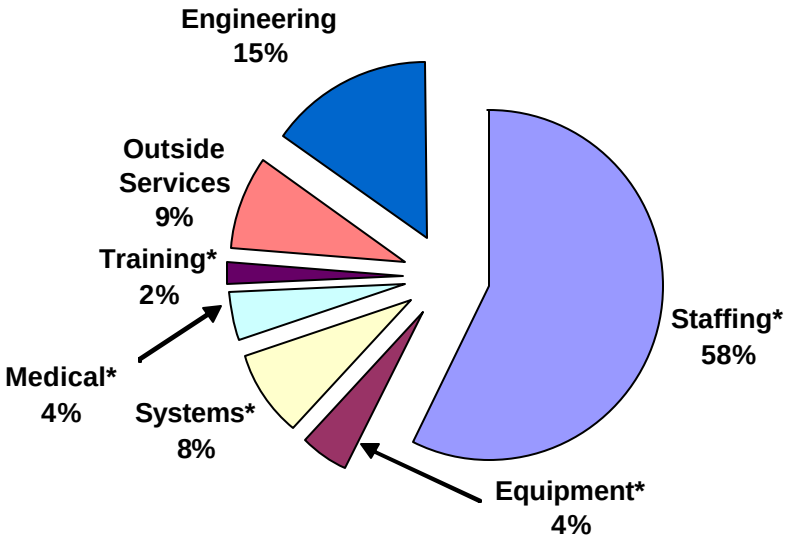
RECURRING FIRE PROTECTION PROGRAM COSTS

Yearly or recurring fire protection costs for CY 2004 reached $135,086,487. for the DOE Complex. On a ratio of cost to replacement property value (recurring cost rate) , the DOE spent approximately 18.6 cents per $100 property value for recurring fire protection activities.

Figure 11 shows the CY 2004 recurring cost distribution by activity. Figure 12 lists the recurring cost rate by DOE field organizations. It should be noted that not all recurring cost activities were consistently reported, such as outside contracts and maintenance activities. Additionally, sites that did not report recurring costs this calendar year (primarily LANL, ETTP, BNL) had their costs carried forward from the past reporting period to maintain the validity of the statistic.

Figure 11

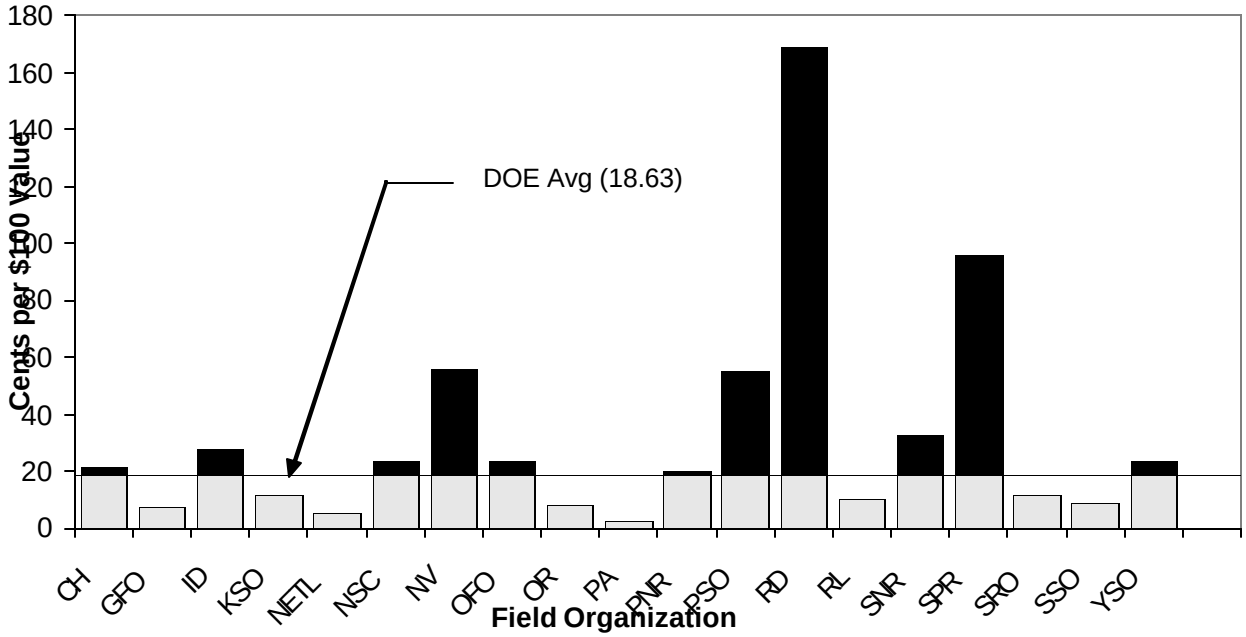
Recurring Fire Protection Cost Distribution



* Fire Department Activities

Figure 12

Cost Rate by Operations Office



Note that in CY-04, RF had a Cost Rate of $ 4.70 per 100 dollars replacement value.

FIRE DEPARTMENT ACTIVITIES

a. Number of Responses: The following is a summary of fire department responses for CY 2004.These numbers represent data sent in from approximately 18 of the 22 fire departments stationed at DOE sites.

1.	Fire	606
2.	Hazardous Materials	433
3.	Other Emergency	2,114
4.	Other Non-Emergency	2,181
5.	Medical	1,934
	Total	14,416

Comparing this data to the actual type of response is difficult since sites do not report incident responses in a consistent fashion. The Office of Environment, Safety and Health is examining the use of a standard reporting format which complies with the National Fire Protection Association's Guide 901,"Uniform Coding for Fire Protection" that could be linked to other DOE incident reporting programs for an accurate and cost effective approach to data collection in DOE. Other options, such as folding DOE's fire data collection into State or National programs such as the National Fire Incident Reporting System, are also being considered.

b.Major Equipment Purchases:

Table 7: **Major Equipment Purchases**

LOCATION	DESCRIPTION	AMOUNT
RL/HAN	85-Ft Aerial Ladder Truck	$980,000.00
RL/HAN	(2) Wildland Brush Trucks	$904,800.00
CH/FNAL	Vehicle	$190,011.39
ID/INEEL	Pneumatic Shoring Equipment	$114,000.00
SNR/KAPL	Scott SCBA	$75,000.00
ID/INEEL	Chemical Biological Radiological Upgrades for SCBAs	$66,000.00
KSO/KCP	Plyomvent system for E-1	$35,000.00
NV/NTS	Hazmat response trailer	$17,500.00
PNR/BAPL	SCBA Cascade	$15,527.00
NV/NTS	Technical Rescue Equipment	$12,500.00
SNR/KS	ATV (2)	$12,000.00
SNR/KS	Chem Suits	$8,700.00
SNR/KS	Wildland Trailers (2)	$4,000.00
SNR/KS	Extinguishers	$3,200.00

c. Notable Response Descriptions, such as mutual aid responses, that are not already included in this Report:

Table 8: **Notable Responses**

LOCATION	DATE	DESCRIPTION
YSO/Y-12	01/08/2004	Fire was reported in an industrial oven in Room 243 of ORNL at Y-12 Building 9204-1. The fire was extinguished with two Dry Chemical Extinguishers. The apparent cause of the fire was due to the oven over-heating.
SPR/SPR	02/2004	DOE Headquarters conducted a No Notice Exercise at the Bryan Mound facility.
OR/ORNL	03/05/2004	Fire Department personnel responded an Anhydrous Ammonia leak at Building 6000. HazMat personnel entered facility to access the leaking cylinder. The cylinder was placed in a containment vessel and moved out of the structure. Scene declared safe and cylinder was transported for disposal.
OR/ORNL	04/13/2004	A fire alarm was received from Master Fire Alarm Box 411 in Building 6000. Upon arrival Command was met by facility personnel who advised that instrument technicians had just changed a resistor on panel BM13-1 in Room T-208. The technicians went to the control room to restore power to panel BM13-1 and noted that the power exceeded the normal operating range which caused the capacitor to blow oil out, causing the unit to smoke. An employee in the area actuated the auxiliary pull station located in the center stair on the second floor, just outside the tower. Two fire officers and three firefighters entered the facility to investigate the situation. Power was secured and the scene was declared safe.
SPR/SPR	08/30/2004	Procured propane-fueled fire extinguisher training props to enhance training of non-ERT site personnel in addition to designated Support Responder personnel.
KSO/KCP	05/08/2004	Water Damage to computers from chilled water system leak resulting in $1.5 Million damage to computer equipment.
SNR/KAPL		Mutual Aid, Schenectady County for Mass Casualty Incident (MCI) at Conifer Park
SNR/KS		Mutual Aid, Rock City Falls Fire Department (RCFFD) Structural Fires, two
SNR/KS		Mutual Aid, RCFFD Brush Fires, two
SNR/KS		. Mutual Aid, RCFFD Motor Vehicle Accident, one
SNR/KS		Mutual Aid, Saratoga County Haz-Mat, one

CONCLUSIONS

DOE experienced no fatalities or major injuries from fire in CY 2004. The Annual Summary reporting process has recently been automated to streamline data collection and provide a more through review of DOE Reporting Element activities. It is now possible to view all Annual Summary Reporting Element responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels, as well as reference other DOE reporting activities such as ORPS. A copy of the latest version of this application can be obtained at the following internet address: http://www.eh.doe.gov/fire/summary/summary.html.